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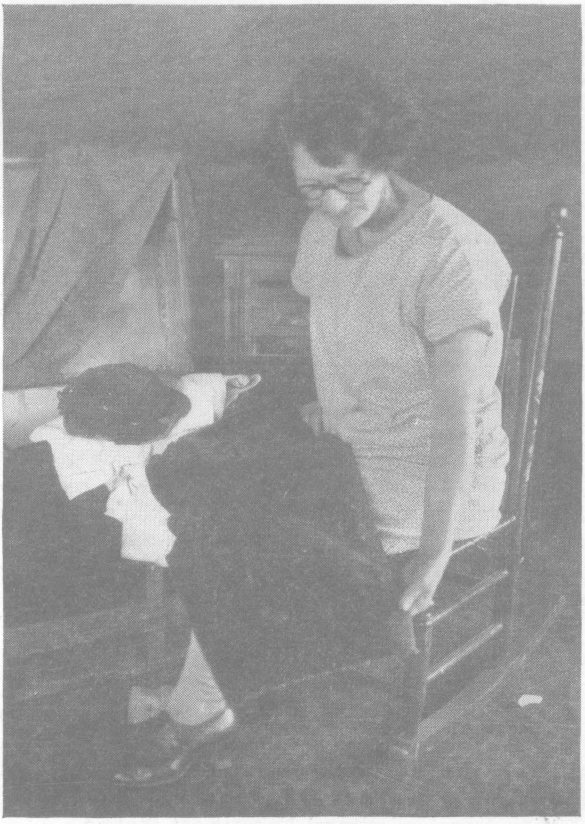
Injurious Household Insects



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Injurious Household Insects

By

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INJURIOUS insects are usually associated with cultivated plants and are best known as out-of-door pests. However, they have followed man into his home, where they are not only annoying by their presence but feed upon his food, clothing, and even his shelter. Few things command the attention of the housewife so promptly as the sudden realization that moths are injuring stored clothing, are present in upholstered furniture, or that cereals are contaminated with meal worms or weevils. Usually, any one of these troubles prompts her to apply immediate remedial measures if she can find them.

This bulletin deals with the principal insects that are known to become pests in homes, together with the best known methods of preventing or combating them. Prevention is the best remedy, but the best of homes sometimes become infested. The good housekeeper should not look on this as a disgrace, since insects have many ways of entering houses. The disgrace lies in allowing these unpleasant situations to exist after the presence of the insects is known.

Insects that Develop in Stored Foods

At least eleven species of beetles and three species of moths are at times found breeding in food and food products stored in the home. Such infested food is usually spoken of by the housewife as "weevily" or "wormy" as the case may be. The damage is done by both the beetle and their larval ("worm") stage and the beetles lay eggs to produce the larvae.

Moths do not feed on stored food but some of their larvae infest dried fruits, meal or flour and become pests of great importance in mills, warehouses and retail stores.

Larvae (or "worms") found in stored food always hatch from eggs laid in or on this food by either an adult beetle or a moth. The development of the insect through the egg and larval stages takes place rapidly in warm rooms. The insect then transforms to a quiescent or pupa stage in or near the food. From this the adult emerges to lay another supply of eggs. Under conditions offered

by warm storerooms and homes the development is uninterrupted and an infestation can build up rapidly from a small beginning.

Confused Flour Beetle *(Tribolium confusum)*

This is one of the beetles most commonly found in flour, bulk cereals, and broken packages of breakfast foods. The beetle is reddish-brown, about 1/8 inch in length and quite flattened in shape. The larvae are up to 1/4 inch in length, white to yellow in color, and hatch from eggs laid throughout the cereal or flour, or in cracks and crevices of bins. The insect feeds on ground cereal products and cannot attack unbroken kernels. Under room temperature the life cycle is passed in a little over one month.

Fig. 1.—Flour containing adults, larvae and pupae of Confused Flour Beetle (after Chapman).

Avoidance and relief from this and other pests that breed in food products is given in the paragraphs under prevention and control (pp. 8 and 9).

Saw-toothed Beetles *(Oryzaephilus surinamensis)*

This beetle is about 1/10 inch long, dark brown, and flattened. On each side of the thorax are six saw-tooth-like projections. These are very distinct and give the beetle its name. The larvae are quite active and crawl about much in feeding. They are white with dark markings, and are somewhat flattened in shape. When ready to pupate they join together small fragments of flour or cereal products and construct a cocoon-like covering. Within this they change to the beetle stage. The life cycle is completed in about one month at summer temperature.

This is one of the common grain beetles infesting flour, cereals, dried fruits, and other food products.

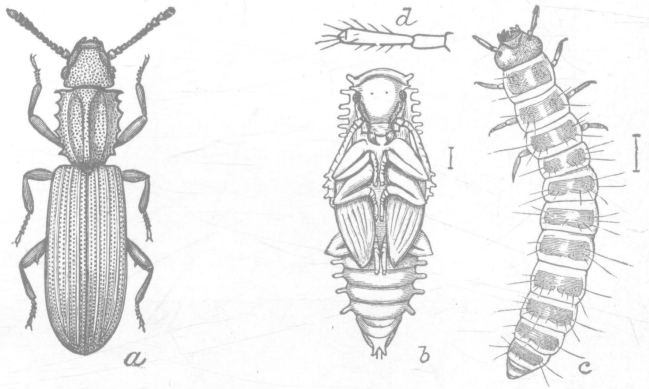

Fig. 2.—Saw-toothed Beetle (a) adult; (b) pupa; (c) larva; (d) antenna of larva. Vertical lines show actual length of larva and pupa. (*U. S. Dept. of Agriculture.*)

INDIAN MEAL MOTH *(Plodia interpunctella)*

This insect is frequently found in homes and is known to infest cereals, flour, dried fruits, spices, and nuts. The adult is a moth with a wing spread of about ⅝ inch. The fore wings are reddish-brown on the outer two-thirds, but whitish-gray near the body. Eggs are laid on the food and hatch into larvae that become about ½ inch long when full grown, and of dirty white color with greenish and pinkish hues. The larva spins a thread which trails behind as it crawls. When numerous, these threads cause the meal or flour to adhere to bins and sacks. When full grown, the larva spins a silken cocoon in which it transforms to the pupa and later to the moth.

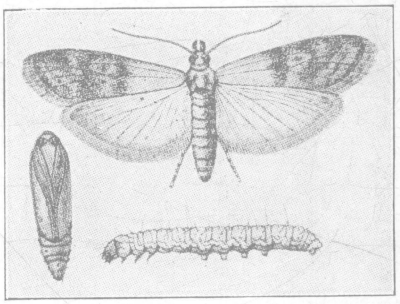

Fig. 3.—Indian Meal Moth showing adult moth, larva and pupa. Greatly enlarged (*U. S. Dept. Agriculture*)

This insect multiplies rapidly in warm surroundings and is a serious pest in grocery stores, even attacking the nuts in candy.

COMMON BEAN WEEVIL *(Mylabris obtectus)*

Beans that are stored for winter use or for seed are often fed upon in storage by this well known insect. The beetles are brown-

ish-gray, and about 1/8 inch long. Some eggs are laid in the field; the beetles place them in cracks in the pod or through holes which the female makes in the same. The egg hatches into a larva or grub that enters the seed coat and feeds within the dried bean. When full grown, it pupates within the bean. The beetle later emerges through a circular opening made in the side of the bean.

The beetles lay their eggs on the beans in storage, from which another generation develops. From a few eggs or larvae brought from the field with the beans a large colony of the insects may develop by mid-winter or spring if the beans are stored in a warm room.

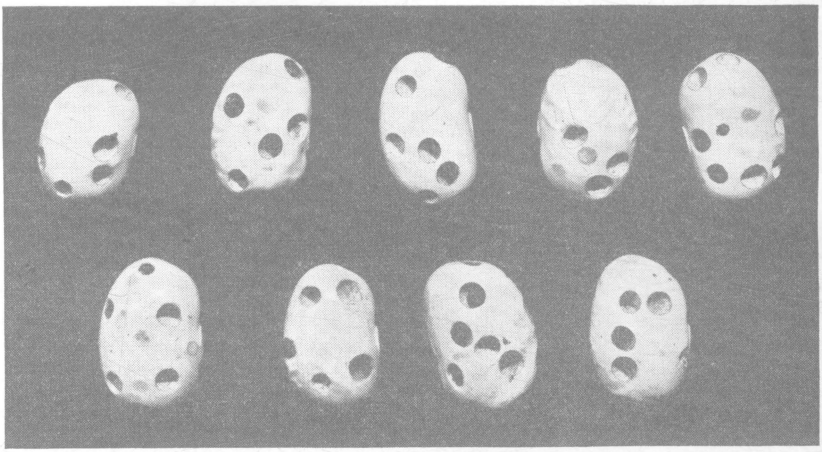

Fig. 4.—Beans damaged by Bean Weevils (Original)

All varieties of garden beans are attacked and several grubs may mature in one seed. Stored beans are often entirely destroyed by the weevil. Severely infested beans should not be planted as they will only produce a weak plant if they germinate. By throwing the beans in a pail of water, the severely infested ones will float and can be discarded.

Prompt threshing and storing of beans after they mature will lessen the chances of infestation in storage. Fumigation with heat or carbon disulfide is the only sure prevention.

Other Insects in Food Products

Besides the four insects described there are others that at times develop in food products in the home. In flour or other cereal products we occasionally find the Mediterranean flour moth *(Ephes-*

tia kuhniella), meal snout moth *(Pyralis farinalis)*, spider beetle *(Ptinus fur)*, red rust flour beetle *(Tribolium ferruginum)*, common meal worms *(Tenebrio molitor* and *Tenebrio obscurus)*, the cadelle *(Tenebrioides mauritanicus)*, drug store beetle *(Sitodrepa panicea)*, cigarette beetle *(Lasioderma serricorne)*, granary weevil *(Calandria granaria)* and rice weevil *(Calandria oryzae)*. Some of these insects are of prime importance in mills, elevators, and storerooms, but are at times brought into the home with cereal products.

The pea weevil *(Bruchus pisorum)* is a pest of green peas and is unable to reproduce in stored peas.

Infesting meats are the larder beetle *(Dermestes lardarius)* and the red-legged ham beetle *(Necrobia rufipes)*. The larvae of both these beetles are covered with hairs and their work is easily detected on hams or bacon. Destruction of infested portions of meats, cleaning of shelves and surroundings, and careful wrapping of hams or dried meat to be kept over for summer use should prevent damage. The larder beetle has been found in feathers and hair and has been recorded as damaging woolen clothes.

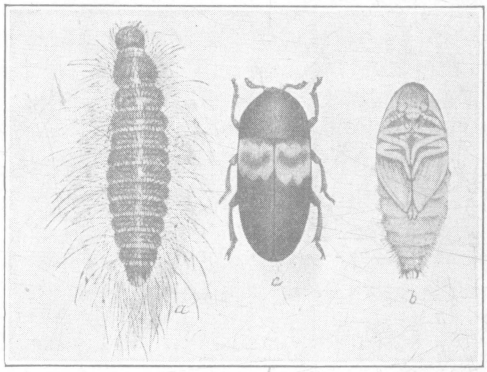

Fig. 5.—The Larder Beetle (a) larva; (b) pupa; (c) adult beetle Greatly enlarged (*after Howard*)

In cheese we find at times the cheese mite *(Tyroglyphus sp.)* and cheese skipper *(Piophila casei)*. The former is a tiny white mite and the latter is the maggot of a fly. Cheese should be kept covered during warm weather or purchased in quantities which will be used immediately. Should these mites once infest a pantry it is difficult to control them, and only thorough fumigation may give relief.

In fresh fruits we find fruit flies *(Drosophila sps.)* laying their eggs in the soft pulp when decay commences, and even in canned fruit left exposed. Fruit flies can be easily excluded by preventing the collection of overripe fruit in the home and covering partially used canned fruit. Window screens will not keep out these flies.

Dried fruits at times acquire infestations of some of the cereal product pests. The larvae of the saw-toothed grain beetle and the indian meal moth are sometimes found in dried raisins, peaches, apples, apricots, and prunes which have been allowed to stand for a period of time before packing.

Prevention and Control of Insects that Breed in Food Products

Weevils and flour moths enter homes in contaminated food products such as flour, cornmeal, or breakfast foods, which have been exposed to egg laying of the beetles or moths in warehouses or storerooms. Most breakfast foods are now sterilized by heat before being packed and are then sealed in paper packages through which weevils cannot enter. Housewives should insist on buying unbroken packages of such products to prevent bringing in weevils.

Containers and receptacles should be thoroughly cleaned of old flour or meal remnants before a new supply is introduced. Infested packages should be removed from the house immediately, and all cereal fragments cleaned out of cracks or crevices of containers, and from the corners of shelves, where a few particles may maintain beetles and provide a supply to infest new products. There is no substitute for cleanliness in the kitchen and pantry if one wishes to avoid insects that attack cereal products.

If a supply is but lightly infested and it is desired to exterminate the insects in it, the same can be done by fumigation or heating the products.

Use of Heat to Sterilize Foods

Package breakfast foods are sterilized with heat and then packed in tightly sealed containers. This frees them of all insect life and they should remain so as long as the package remains unbroken.

Beans to be stored can be subjected to high temperature to kill the eggs and larvae of weevils should they be present at storing time. The beans can then be placed in a tight container with the assurance that no weevils will infest them. The common method is to place the beans in a thin layer in an oven and subject them to a temperature of 130 to 135 degrees F. for 30 minutes. The thermometer reading should be taken from the seeds in the center of the layer. If the beans are to be used for planting, raise the temperature slowly and take care that the temperature does not exceed 135 degrees F. Higher temperature may destroy the germ.

Cereal products or dried fruit in the home can be sterilized by the heat method if they are but slightly infested and the food has not been rendered unfit for consumption. Sometimes flour or meal can be sifted to remove the webbed pellets of meal surrounding the insect, and the remainder subjected to the heat treatment.

Fumigating with Carbon Disulfide

Where large quantities of beans or cereal products are to be fumigated, it is more convenient to use carbon disulfide to kill the insects in them. Carbon disulfide is a very effective fumigant where infested materials can be confined in a small, relatively air-tight space such as a barrel or box. It is advised for treating both food and clothing to rid them of insects.

Carbon disulfide is a heavy clear liquid with a disagreeable odor. It is highly inflammable. and its fumes are explosive when mixed with air. For this reason it must never be used around an open flame or by a person who is smoking. It is used at the rate of 8 pounds to each 1000 cubic feet of space or about one ounce, liquid measure, of carbon disulfide to each 10 cubic feet of space in the container.

Place the chemical in shallow pans or pour it on some rags on the top of the material to be fumigated. The gas is heavier than air; as the material evaporates it will sink through the articles to be fumigated. The container should be kept tightly closed or sealed for 24 to 36 hours at a temperature between 65 and 80 degrees F. Best results are secured when the temperature is at or above 75 degrees F. It is not effective when the temperature is below 60 degrees. When used according to the above directions fumigation will not harm grains or beans for planting, or cereals and dried fruit for food.

If carbon disulfide is not carried in stock by your dealer it can be secured by him on short notice.

The use of this chemical for fumigating clothing to kill moths is discussed on page 22.

Caution

Carbon disulfide vapor is highly inflammable.
Keep flame or lighted cigaret at safe distance.

Insects that Visit Stored Foods

Some insects are pests of stored foods upon which they feed, but do not use as a breeding place. These are chiefly troublesome in the summer season. They are even more objectionable than those which live in stored foods, for the reason that they may carry disease organisms from the places they frequent to our food products. The house fly is probably our chief offender as a disease carrier, while cockroaches are not particular about their associations with filth previous to crawling over our food. Only a careless person will fail to recognize the dangers that these insects bring.

The House Fly *(Musca domestica)*

The house fly is sometimes called the typhoid fly. It is a lover of filth and breeds there. In the country, stable manure is the chief source of house flies. The maggots, or larvae, develop in manure in the stable or soon after the same has been piled outside.

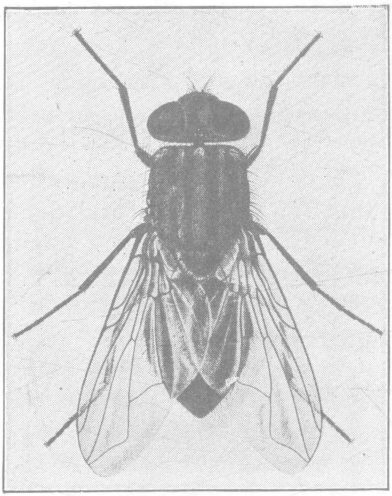

Fig. 6.—The House Fly *(after Howard.)*

During midsummer the house fly pases through a complete generation from egg to adult in eight to ten days. Eggs are laid on the manure and the larvae feed on it, finally changing to barrel-shaped puparia in the loose soil under the manure or at the edge of the heap, if it is piled. From the puparia the adults emerge and unhesitatingly enter open doors or windows to track through our food. A lover of filth and a frequent visitor to open privies, where human disease organisms abound, the house fly is pretty certain to be well supplied with so-called "germs" before reaching our food. Not only on its body, but in its alimentary canal will disease organisms be found.

In the cities, where motor vehicles have replaced horses, the breeding places for flies are now limited largely to garbage. During midsummer, garbage, unless tightly covered from flies, soon acquires a supply of wriggling larvae or maggots. Fortunately, our city and county health authorities, together with other agencies, have educated the people to the need of proper garbage disposal as

well as the necessity of screening food from flies. This has resulted in a marked reduction of fly annoyance in cities. More care should be used to guard the food supply in the rural homes, where the house fly is still a big problem.

The house fly is known to carry disease organisms that produce typhoid fever, dysentery, tuberculosis, and summer complaint. The health records of the occurrence of intestinal diseases show these diseases to reach their peak annually during late summer and fall, following the season of most abundance of this insect.

Control Methods.—The best method of control is to prevent the accumulation of breeding places. In the city this is well taken care of through sanitary sewage disposal and frequent removal of garbage to a safe distance. In the country much could be done to improve the conditions maintaining this nuisance by the weekly removal and scattering of stable manure.

Good window screens are absolutely necessary in all homes. Where doors are opened frequently and flies gain entrance they can be poisoned easily with a mixture of formalin and milk consisting of a tablespoon of 40 per cent formaldehyde placed in a pint of equal parts water and milk. This is placed in pans or saucers with a piece of bread in the center on which the flies may alight and lap their food. This bait should be kept out of reach of children and domestic animals. Fly poison, tanglefoot, sprays, and traps are excellent to catch flies that enter homes, but give little permanent relief unless the breeding place is removed.

COCKROACHES (*Blatella germanica* et al)

There are several species of cockroaches which infest homes. Of these the German roach is most common. They are very active and move from house to house. Roaches will enter through open basement windows during the night or may be brought in with wood. After gaining entrance to a house their numbers steadily increase until they become a nuisance. Possessed of extremely flattened bodies, they can hide behind what is seemingly a tight baseboard and explore the dust and dirt that lurks in every crack and crevice.

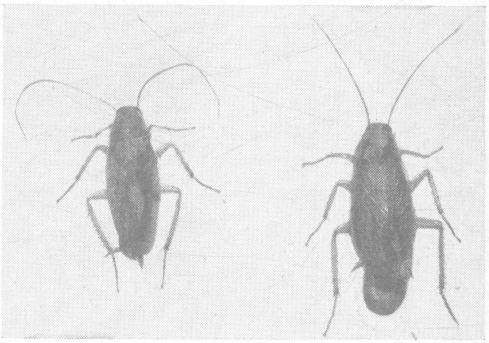

Fig. 7.—The German Cockroach; male, left; female, right. (Original.)

At night the cockroaches scurry forth and wander over floors and walls and will enter almost any place where food is stored. They are partial to warm kitchens, basements, and storerooms, and assemble in the vicinity of water pipes and steam pipes, to which they are probably attracted by the moisture. Restaurants are frequently found infested, and libraries, storerooms, and even drug stores are at times confronted with this problem.

The eggs are laid in clusters scattered over floors and behind baseboards, where the insects hide. They hatch into small roaches, which have the same habits as the parents, and feed upon cereal products, meats, fruits, cocoa, and even on clothes and books to get the starchy materials from them. Their stain is also a nuisance on white clothing, paper, and woodwork. There are only one or two generations per year.

Control Methods.—Fumigation with heat or cyanide gas is the best method of control where entire buildings or storerooms are infested. In the home, fumigation is rarely necessary because the insects can usually be exterminated through the use of sodium fluoride. This is a white powder which can be purchased at most drug stores, and is a slow acting poison when taken into the stomach of an insect. It should be scattered liberally in the runways of roaches, which they frequent at night, and where they will collect particles of the fluoride on their feet, legs, and body appendages as they crawl through it. In

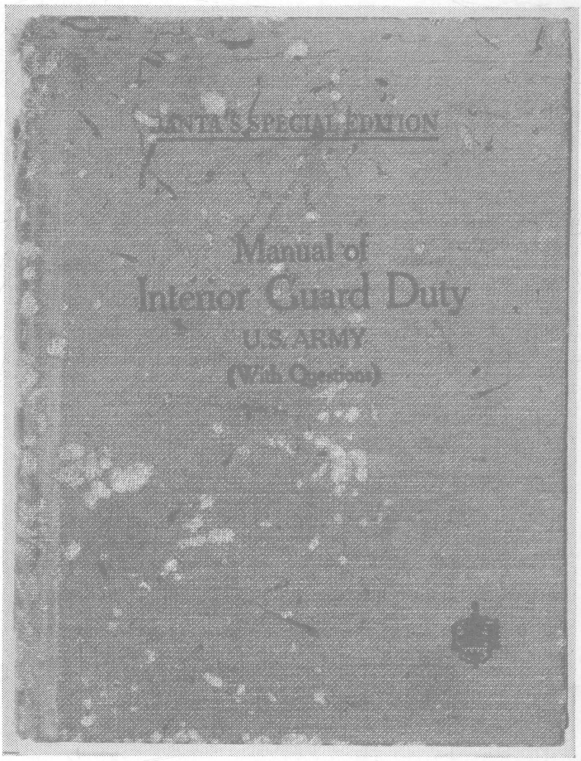

Fig. 8.—Book damaged by cockroaches. (Original.)

cleaning themselves of this powder, the legs are drawn across the mouth and bits of the poison are swallowed.

Where sodium fluoride is used persistently, and in sufficient amounts so that cockroaches are forced to crawl through it, they will gradually disappear until complete control is secured. It may take several weeks to bring this about when a home is overrun with roaches. Most commercial roach powders contain this material as the killing agent.

Cockroaches may also be poisoned by a bait made by mixing arsenic and paste or glue, and daubing this on pieces of cardboard.

House Ants (*Monomorium pharaonis* et al)

There are several species that frequent houses, but the little red ant, called Pharaoh's ant, is the best known. This species passes its entire life in heated houses. Another closely related

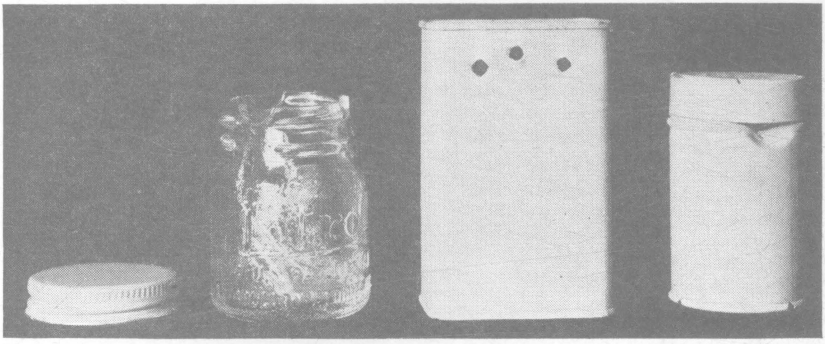

Fig. 9.—Types of containers to hold poisoned sirup. These allow ants to enter and carry away the poison when fitted with a lid or cover. (Original.)

species is the little black ant, which is essentially a lawn or meadow ant, where it rears its colonies. There are several species of ants that enter homes, and the housewife is at a loss to know where they come from and interested in the best method to use to get rid of them.

Ants are social insects and live in colonies, usually in the soil or foundation of buildings. The ones seen in the houses are workers, which carry food to the young in the nest, where the queen is located and where the eggs are laid. The eggs and larvae are cared for by the workers in the same manner as in the colonies of the honey bees.

The food of ants may be divided into two classes. One group is attracted to sweets, while ants of the other group show their

fondness for greasy foods. Those which eat sweets will also feed upon meats and grease to some extent and likewise the grease eaters will not refuse sweets. The housewife is usually able to tell to which group they belong. She finds that unless her kitchen is clean and her dishes and food are put away promptly after meals the ants will soon cover the food they like.

Control Methods.—It is often possible to trace the ants to their nests by following the line of marching workers. This is sometimes made easy by placing out a small pile of granulated sugar and then watching the ants as they follow a line bearing the sugar grains to their nest. If they are nesting in the lawn or garden soil, the colony can be eradicated by means of boiling water or by the use of carbon disulfide forced into the nest through the spout of an oil can. Close the entrance of the nest immediately after inserting the chemical. This vaporizes rapidly and the vapor sinks throughout the nest.

Fig. 10.—Treating nests of ants with carbon disulfide. Chemical is forced into nest with oil can. (Original.)

If the source of ants cannot be located, one must resort to poisoned baits. In order to poison the sweet-eating species, nothing is better than a sirup containing a small amount of arsenic upon which the ants will feed and will carry the poisoned sirup back to the young and the queen in the colony. This poison is sold under various trade names and is quite effective. It should be exposed in small containers fitted with lids which will allow ants to enter, but which cannot be opened by children (see Fig. 9). Good results have been secured in lawns by scattering brown sugar mixed with paris green in the runways of the ants.

For the grease-eating species, probably the best control is obtained by rubbing tartar emetic on strips of raw or cooked meat

such as bacon rinds, and placing these in cans fitted with tops that will allow ants to enter, but are inaccessible to children or domestic animals. A mixture of one part tartar emetic with twenty parts of bacon drippings has been used effectively in this manner.

Ants have been repelled satisfactorily by laying down a barrier of kerosene placed at the point of entrance into the house and have been prevented from entering refrigerators by setting the casters of the same in cups or lids filled with water. The ants are unable to gain entrance to the food thus insulated from the floor.

Another effective repellant is strips of cotton tape boiled in a saturated solution of bichloride of mercury (corrosive sublimate). This must be done in a porcelain or granite-ware container, as the chemical will attack metal household utensils. The tape is then dried and tacked around table legs or other places where the ants must cross to reach food. They will not cross the treated tape and it will retain its repelling power indefinitely. *Bichloride of mercury is poisonous and must be kept out of reach of children.*

Insects that Infest Clothing, Rugs, and Upholstered Furniture

In Ohio the larvae of two species of moths and four species of beetles are known to feed upon clothing, rugs, or upholstered furniture. These insects are all attracted to the material by the animal products which they contain. The products may be wool, hair, fur, or feathers. Most people are well acquainted with the damage these so-called "moths" can do when they feed upon valuable clothing, carpets, furs, or overstuffed furniture.

The Webbing Clothes Moth *(Tineola biselliella)*

It is the larva of this moth that calls for most of the worry of the housewife when she examines woolen clothing that has been stored through the summer months and finds that it has become infested with moths. It is known as the webbing clothes moth, because of its habit of spinning a web over the surface where it feeds and beneath this web cuts through the fabric, consuming the woolen threads with the resulting damage only too well known.

The larva is white in color and is about ½ inch long when full grown. After completing its feeding, it spins a silken cocoon, interwoven with bits of fabric and excrement, and in this cocoon transforms to the moth or adult stage. This is the stage which gives the insect its name.

The adult moth does not feed upon clothing, but lays the eggs which produce the damaging larvae. The moth flies about at night and hides during the day in folds of cloth, in the closet, or in crevices in upholstered furniture. The eggs are laid in stored clothing to which the moth gains access, and in furniture, on the seams and crevices between two pieces of covering, or in the pile of the fabric. The eggs hatch in from one to two weeks, depending upon the temperature, and the larvae select a favorite spot where they can feed upon the cloth or on the underside of the pile in upholstered furniture. The larval period may last from two months to two years. Because of this varied length of the larval period, adult moths are present almost constantly in badly infested homes.

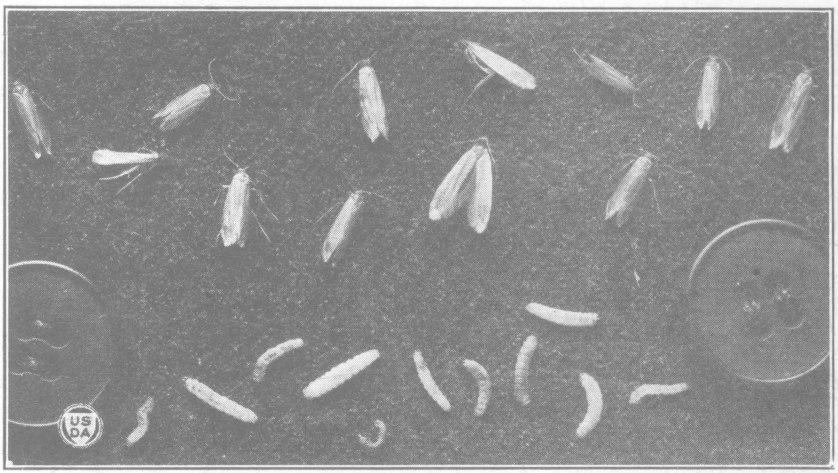

Fig. 11.—Webbing Clothes Moth: Adult or moth above and larva below (after Back.)

Buffalo Moths or Carpet Beetles

(Anthrenus scrophulariae, A. verbasci, and *A. piceus)*

Under the name of "carpet beetles" we have in Ohio three insects which infest furniture, carpets, and stored woolens. These are not moths but beetles, the larvae of which are often referred to as "buffalo moths" or "carpet moths." These are different from the larvae of the true clothes moths in that they are brown, clothed with hairs, and the body segments are ornamented with short tufts or rows of hairs. Those on the rear of the body are much longer and have the appearance of a brush-like appendage. They do not spin a web on the cloth or a case around themselves, but work along

the cracks of a floor under carpet, along the seams of carpet, beneath the covering of upholstered furniture, and in stored clothing. They are expert in finding woolen blankets put away or stored indefinitely.

The adults of all three species are small, dark colored beetles approximately 1/16 to 3/16 inch in length. Adults of *A. scrophulariae*,

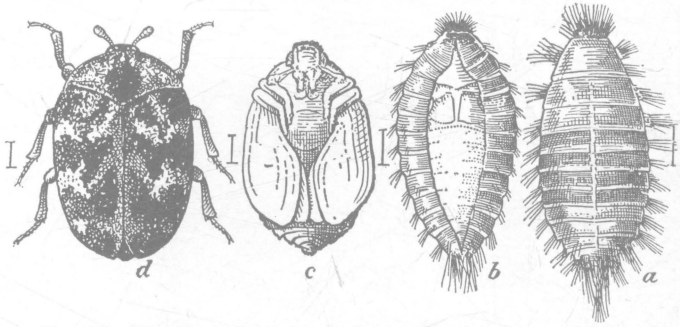

Fig. 12.—The Carpet-beetle or Buffalo-moth. (a) larva; (b) pupa in larval skin; (c) pupa from below; (d) adult. Greatly enlarged. (After Riley.)

which are known as "Buffalo moths," enter houses in the fall, and in early spring collect on windows in an effort to get outside. During early summer they are found on flowers of spirea and, later, on goldenrod and other flowers. There appears to be some danger of bringing the beetles into the homes in bouquets of these flowers.

Carpet beetles are not the pests in homes they once were, because rugs have largely replaced carpets which formerly were tacked to the floor. Their development in woolen materials is slow, and frequent removals and cleaning of rugs is disadvantageous to them. They are frequently found in overstuffed furniture and now constitute a serious pest of furniture as well as woolens in storage. The eggs are laid by the beetles in the same places as described for the clothes moth.

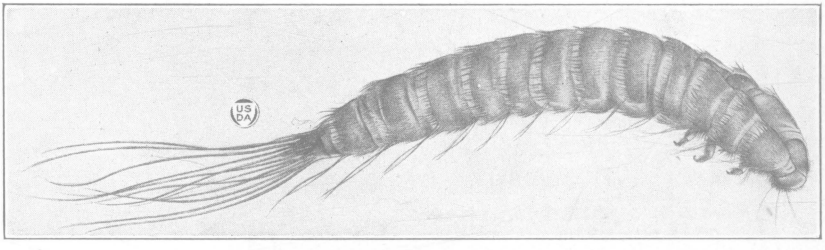

Fig. 13.—Black Carpet Beetle; larva skin showing the typical shape and the tuft of bristles at end of body. Greatly enlarged. (After Back.)

THE CASE-MAKING CLOTHES MOTH *(Tineola pellionella)*

This is a common species, and differs from the webbing clothes moth in that the entire larval existence is passed in a cigar shaped case or tube open at each end. When feeding, the head and part of the body of the larva protrude from one end of this case. When disturbed, it retreats within its shelter. There is but one generation annually and the insect winters as a full grown larva. Pupation occurs the following spring or summer either on or near its feeding place, and the moth emerges during the summer months to lay eggs for a new supply of worms.

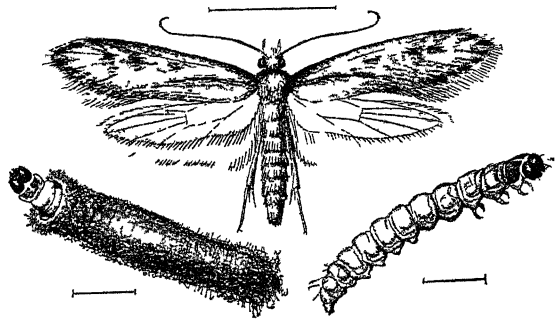

Fig 14.—Case-making Clothes Moth center, adult moth left, larva in case or tube right larva Enlarged (After Riley)

Both this and the preceding species enter homes either as moths through open windows, as eggs on clothing, or with infested articles brought into the home. They are attracted to soiled clothing and will seek out soiled spots. They will also feed upon lint in open registers of the heating plant unless these are cleaned regularly throughout the summer.

CIGARETTE BEETLE *(Lasioderma serricorne)*

The housewife occasionally finds in her upholstered furniture some very small brown beetles and some tiny white grubs well covered with long hairs. These are the adults and larvae of cigarette beetles. As the name implies, they are more commonly recognized as pests of tobacco, since they infest cigarettes, cigars, and other tobacco in storage. They also infest stored food, including

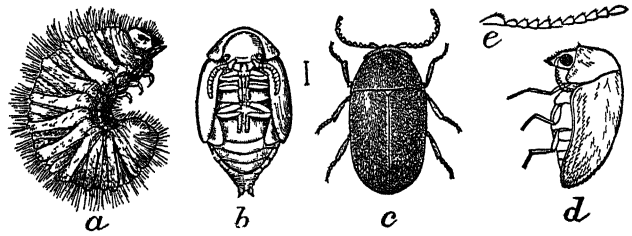

Fig 15.—Cigarette beetle (a) larva, (b) pupa, (c) adult (d) side view of adult (e) antenna of beetle Greatly enlarged (after Chittenden)

rice, figs, and even cayenne pepper. They sometimes become abundant in furniture, where the grubs and beetles may cause serious damage; they are known to furniture dealers as "tow bugs."

How to Prevent Damage from Moths and Carpet Beetles

It is only after moth damage has occurred that the housekeeper realizes the value of prevention over cure. Moth damage in clothing and furniture can be rather easily prevented by the proper precautions if these are taken in time.

Fig. 16.—Brushing valuable furniture in corners and along seams of cushion to remove moth eggs. This should be done frequently. (Original).

When woolens are not to be used during the summer they should be thoroughly cleaned to remove dirt and soiled spots which attract moths. It is always a good practice to have overcoats and suits cleaned and then sealed in paper bags or hung in a closet where they will not be disturbed; naphthalene flakes should be stored with them.

If such articles are not cleaned and stored properly they should be inspected frequently during the summer and repeatedly hung out to sun and be well brushed. This will remove eggs or larvae which may be hatched. It is important that inspection, brushing, sunning, and airing be not neglected during the summer.

Valuable furs, if not to be worn, should be taken to a cold storage or thoroughly aired, brushed, sunned, and sealed with naphthalene in moth-tight containers.

Fig. 17.—Chair damaged by clothes moths *(Courtesy of Fireproof Warehouse and Storage Co., Columbus, Ohio).*

Overstuffed furniture should be brushed out thoroughly along the seams and under the cushions, preferably once each week and not less frequently than every two weeks. Brushing removes the eggs of moths or beetles which usually are deposited in such places. It is very difficult to kill moths that infest overstuffed furniture after they once gain entrance, unless the same is subjected to heat or fumigation treatment.

The supply of clothes moths in a home is likely to come from articles of clothing which have been stored away in an attic with the expectation that they might "some time" be used. If these contain wool or hair it is advisable to dispose of them rather than keep them to breed moths.

How to Store Clothing

If freedom from moth damage is to be enjoyed it is necessary that clothing be properly stored. Cedar chests are excellent containers in which to store woolens in order to prevent moth damage. Red cedar wood possesses a volatile oil which is repellent to the moths and is now used to some extent in wardrobe construction. This volatile oil kills small larvae present in stored clothing but will not kill larvae more than half grown.

If clothing is properly cleaned when put in storage, so that it contains no moth eggs or larvae, any box or chest which is tightly built and prevents the entrance of moths is as good as a red cedar chest. Cedar shavings or chips are only partially effective and usually do not contain enough volatile oil to repel or kill clothes moths.

Moth Repellents

Naphthalene, which is the ingredient in moth balls, is one of the best known materials to be stored with clothing to protect it from moth attack.

Another material known to be effective is paradichlorobenzene. This material vaporizes slowly when exposed to air and the gas is non-toxic to man, but paralyzes insects when present in sufficient

concentration. To kill moths it should be used at the rate of about one pound of the chemical to each 10 cubic feet of space. For this reason its use is limited to woolens stored in trunks, closets, or drawers which will not be opened frequently during the period of storage.

Paradichlorobenzene is the killing agent in several products now being sold under trade names to kill moths in houses. These are to be opened to the air and hung in the closet or placed in drawers or trunks where the clothing is stored. These products have merit when used under proper storage conditions and in proper amounts so that the gas evolving from them is of sufficient concentration to be effective. The housewife should not use paradichlorobenzene in any form to be hung up or scattered about over a room, or forced into overstuffed furniture by air pressure from vacuum cleaners. The amount of the chemical which would penetrate the fabric of the furniture is too small and the air circulation in the room is too great to make such practices effective.

Some housewives may prefer to use other repellents than those suggested and may feel that they have always protected their clothing with some other home remedy. In a publication of the United States Department of Agriculture* the following agents are listed as useless for this purpose: allspice, black pepper, cayenne pepper, borax, red cedar leaves, eucalyptus leaves, formaldehyde, hellebore, lead-carbonate, lead-oxide, lime, quassia-chips, sodium bicarbonate, salt, sulphur, tobacco, and lavender-flowers. It is likely that whatever apparent success has come from using any of these materials may be due to the fact that moths were absent in the first place, or that the woolens were so thoroughly cleaned or so well stored that moths did not find them.

Moth-Proofing Materials

There are commercial products now offered for sale under trade names which are to be sprayed on woolen fabric or into which clothing can be dipped and rendered immune to damage, or made "moth-proof." Some of these have merit while others are of little value, except to kill the moths in the material at the time of treatment. Gasoline or dry cleaning processes will do this, but cleaned fabric will become infested again if it is exposed to the presence of moths. A successful moth-proofing material, besides protecting the fabric against moth attack, must be non-toxic to man and leave no stain or odor.

* Scott, Abbot and Dudley, U. S. Dept of Agriculture, Bureau of Entomology, Prof. Paper, Bul. 707.

A solution of sodium fluocilicate in water at the rate of 1 to 2 ounces of sodium fluosilicate dissolved in a gallon of water has been found to protect woolen fabrics for some time against moth infestation.

Recently certain salts of Cinchona alkaloids, when dissolved in petroleum naphtha, have been found to protect fabrics from moth attack for five years after treatment. This material gives promise of being well adapted to combining with dry cleaning fluids to render the cloth moth-proof after the cleaning fluid has evaporated. Both of the above products are now widely offered for sale under trade names and experimentation is proceeding with still other materials.

Successful moth-proofing materials now seem quite promising, and no doubt this method will soon be widely used both in the manufacture and care of rugs and furniture. At present the method lacks the confidence of the public, including many retail furniture stores, due largely to unsatisfactory results with some materials that have been marketed for this purpose.

Moth Eradication by Heat or Poisonous Gases

Heat.—Clothes moths, carpet beetles, and book lice cannot stand high temperatures and this fact is utilized in eradicating them from furniture by super-heating. In the home, infested clothing and furniture may be assembled in one room during a warm day of midsummer and the heating plant utilized to raise the temperature of this room so that it is maintained at or about 130 degrees F. for three or four hours (see page 40).

Some furniture stores have equipped themselves with super-heating rooms where the temperature can be raised to a satisfactory degree at any time of the year and where they make a business of eradicating moths in furniture brought to them.

Carbon Disulfide.—Carbon disulfide is very effective against clothes moths, but its use is limited to small space such as closets, trunks, or tight boxes in which woolens or furs may be stored. The fumes of carbon disulfide are highly inflammable and should not be used near an open fire.

In the fumigation of a closet, first make provisions for the door to shut tightly to prevent the circulation of air. Fumigation with carbon disulfide requires ¾ pound (9 fluid ounces) of the chemical to each 100 cubic feet of closet space. Pour the proper amount of carbon disulfide to be used in shallow trays on the top shelf of the closet. If the door does not fit tightly when closed, seal the cracks

Fig. 18.—Closet prepared for fumigation with carbon disulfide. The liquid is exposed in shallow vessels above clothing and door sealed to prevent escape of gas. (Original).

with strips of paper. To fumigate clothing in trunks and chests, proceed as given under bean weevil fumigation (page 9).

Use carbon disulfide only when room temperature is above 65 degrees and preferably above 70 degrees F. Fumigation should be continued for at least 24 hours before airing.

Be careful to keep flame or lighted cigaret at safe distance.

Carbon Tetrachloride. — Carbon tetrachloride is also a heavy gas that will kill insects, but is not nearly so toxic as carbon disulfide. However, it is non-inflammable, and if used in sufficient amounts is preferred to carbon disulfide where the fire hazard is great. Over twice as much of it is required to be as effective as carbon disulfide, which makes it more expensive. If this material is used, one should follow the directions given for carbon disulfide (page 22), and use 1½ to 2 pounds of it to each 100 cubic feet of space. Because of its low killing power, it is now used preferably in combination with ethylene dichloride, which is a gas much more toxic to insects than carbon tetrachloride.

Ethylene Dichloride—Carbon Tetrachloride.—When three parts of ethylene dichloride are added to one part of carbon tetrachloride the mixture is non-inflammable and also an effective fumigant. The ingredients mix well and evaporate almost as a single compound. The gas has excellent powers of penetration and since it requires less material, the mixture is more economical to use than carbon tetrachloride alone.

This mixture should be exposed from the upper part of a closet or box in the same manner and with room temperature as described for carbon disulfide (page 22). Use it at the rate of 1¼ pounds per 100 cubic feet of space.

These chemicals are probably not carried by the average retail drug store, but can be secured from the wholesale drug houses.

Insects that Infest Timbers in Buildings and Furniture

POWDER POST BEETLES *(Lyctus sp.)*

Occasionally one's attention is called to timbers in a building where fine yellow powder has collected in small piles over the surface. When this is brushed off, a tiny round hole is revealed. This is the work of an insect known as the powder post beetle. The work of this insect is found in floors, joists, posts, rafters, or even unpainted siding of houses or barns. The flour-like powder is pushed out of the timber and falls to the floor below or collects in piles on the surface. Beneath the surface of such timbers the work of the insect goes on, and the solid wood is being ground into a powder as the grub of this beetle bores through it. Cutting

Fig. 19.—Larva of a Powder Post Beetle (after Chittenden).

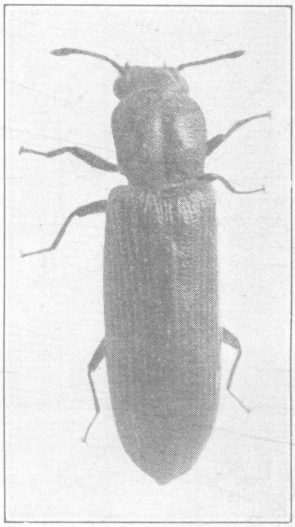

Fig. 20.—Adult of a Powder Post Beetle (after Chittenden).

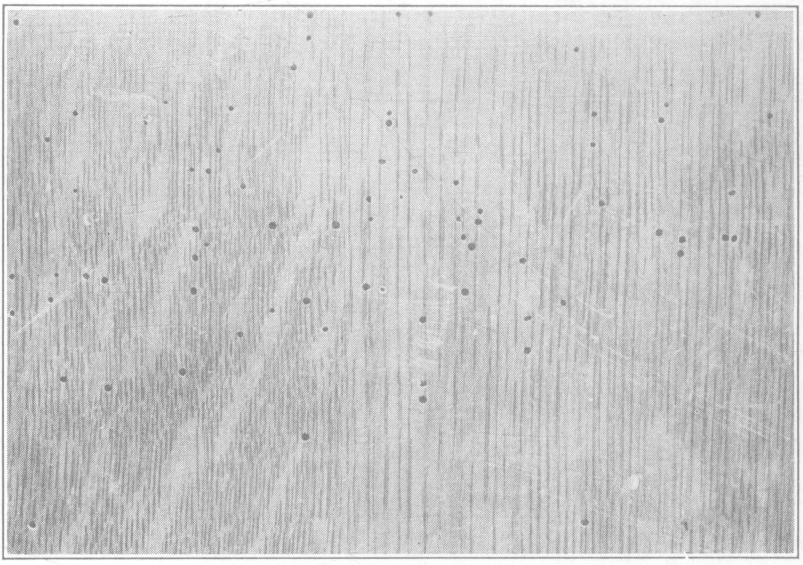

Fig. 21.—Powder Post Beetle work in oak file case showing exit holes of adult beetles. (U. S. Dept. Agriculture).

open a piece of infested wood reveals the grubs and damage they have done. Sometimes a building has to be partially reconstructed because of the work of the insect. Rustic cabins are frequently infested, and at times furniture and even picture frames are damaged.

The adults are small dark brown beetles not over 3/16 inch long. They appear in the spring and the eggs are deposited in the pores of seasoned timber. The grubs which hatch bore into the wood and feed inside until mature, when they construct a cell in the burrow and pupate. From this the adult emerges in the spring.

The powder post beetles attack only well seasoned wood, whether kiln dried or allowed to season naturally. Second growth ash, hickory, and oak are the principal timbers attacked, although the insect will work in other hardwoods, such as walnut, maple, cherry, elm, poplar, and sycamore.

Control Methods.—When this insect is first noticed, it is time to commence fighting it. If the damage is severe, remove infested timbers, if possible, and replace with sound ones. Coal tar creosote acts as a repellent to the beetles. Where the stain is not objectionable this can be sprayed on the surface of the wood to prevent further egg laying. Since the eggs are laid in the pores of the wood, an application of paint, varnish, shellac, paraffin wax, or other filler will close the pores and prevent further damage.

Termites or White Ants *(Reticulitermes flavipes)*

Early in the spring one is sometimes surprised to see, especially in basements, swarms of black winged "ant-like" insects which seemingly come from nowhere. Their presence immediately reveals that somewhere in the timbers of the house there is feeding a colony of "white ants" or termites. The swarming is an effort of a part of the termites to establish a new colony, similar to the habits of the honey bee. The swarming colony has

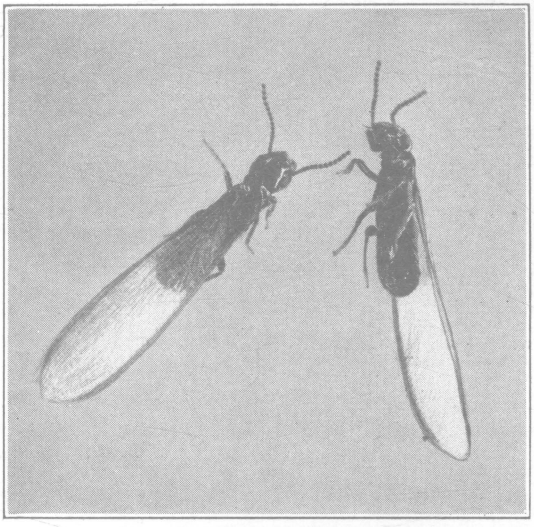

Fig. 22.—Winged adults of Termites. Greatly enlarged (after Snyder).

come from buried wood, or timbers in direct contact with the moist earth. They feed in the timbers.

Termites to the casual observer very closely resemble ants, but they are not true ants. Their native habitat was in the forest, where they lived on the decaying timber. Coincident with the scarcity of decaying stumps and logs, termites have become increasingly destructive to woodwork of buildings, telephone poles, fence posts, or any timber in contact with the soil. The only known food of termites is cellulose, which they obtain principally from dead and sometimes living vegetation.

Termites are rather small, frail, dirty white insects, somewhat the shape of small ants. A colony is made up of several casts, as are ants and bees—that is, warriors or males, workers and queens. They are wingless, except for the sexual forms at the time of swarming. The wings are lost as soon as the new colony is established. The eggs are laid by the queen underground and the newly hatched young resemble the parents, except in size.

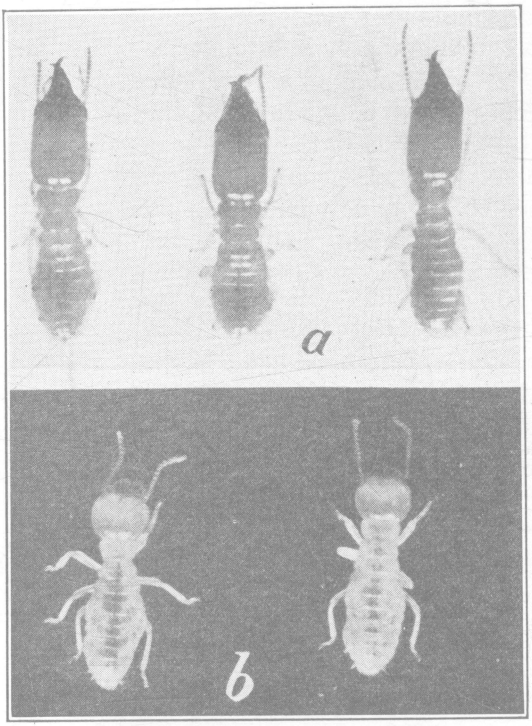

Fig. 23.—Mature soldiers (a) and mature workers (b) of the common termite. Greatly enlarged (after Snyder).

The little termites consume the cellulose in the wood as they grow. They make channels through timbers at considerable distance above ground, but always maintain unbroken connection with the earth.

Termites have a very delicate cuticle and it is necessary for some casts to have contact with moisture at all times. The nest of the termites is always in wood underground. This may be a dirt-covered block of wood left from building construction or some part of the building timbers which come in contact with the soil. They work up into the dry

building timbers and even into the furniture and under rugs, but in every case they have some direct contact with the soil.

It often becomes necessary for these little creatures to construct "sheds" or covered runways of mud and excrement along a brick or cement wall or along metal supports so that they can be under cover. In a house in Sandusky, Ohio, termites built such "sheds" along a metal support to the first floor joist in a house. They tunneled through the timber, ate the underside of the rugs, and even honeycombed a wooden picture frame which was hanging on the wall. They are known to feed upon the paper in books and

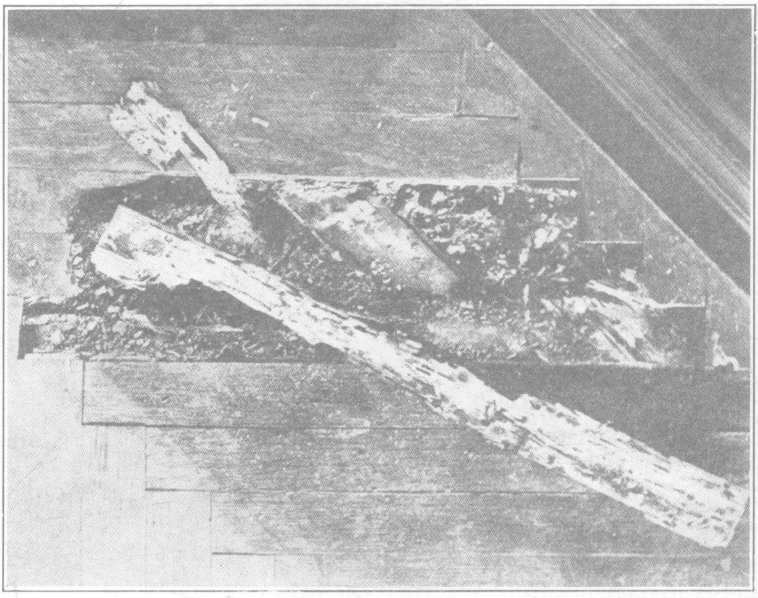

Fig. 24.—Quartered oak flooring damaged by termites (after Snyder)

are sometimes a pest of books in basements of libraries. Because these insects work almost entirely under cover they may do considerable damage before they are discovered.

Control Methods.—The first thing necessary to control termites is to locate the colony and destroy it. Sometimes this is difficult to find, but close examination should reveal some part of the building in contact with the soil or the covered runways which they have built. Remove the timbers in contact with the soil and replace with concrete or creosoted timbers. This will prevent them from entering the house. If mud-covered runways are built along the basement wall, these should be destroyed. In construction of houses, care should be used to have the wooden frame work or

wood plates supported on the concrete and no wood posts in contact with the earth.

Recent publications carry the following new control method which has been used successfully by the authors and is worthy of trial before going to the expense of removing timbers:

"Paris green, dusted into their runways, when located, promises victory in the war against termites, sometimes called "white ants." The effectiveness of the Paris green dust depends, first, on the cleanliness of the termites; they are forever licking themselves clean, and thus swallow the deadly powder. After they have died, or are very notably weakened, a second termite habit comes into play. The insects are cannibals through thrift; they eat up their deceased relatives. It does not matter if the dead termite met its end through poison; it gets eaten anyway. Thus we find that the same dose of Paris green may do away with several termites in sucession."

Insects that Attack People

BEDBUGS *(Cimex lectularius)*

In addition to attacking man's food, clothing, and shelter, some insects at times inhabit or enter homes and attack man himself. The bedbug is one of these pests, and is looked upon with as much disfavor as any of the household insects. The insects gorge themselves with blood while a person is sleeping, and are known to carry human diseases. Bedbugs may at times enter the best kept homes by being carried on clothing, through the purchase of second hand mattresses or furniture, or even in the baggage of travelers. They are also known to migrate from one house to another in cities. Wherever found, immediate steps should be taken to eradicate the insect.

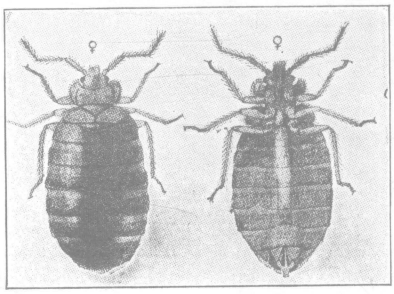

Fig. 25. — Bedbugs — greatly enlarged (after Marlatt).

Bedbugs are nocturnal in habit, but, when hungry, will emerge in a lighted room to seek food. They hide by day in natural hiding places afforded by loose wall paper, under baseboards, in cracks in the floor, or in and along the seams and tufts of mattresses. They have no wings and cannot travel far unless carried by people. They may live as long as six months in

unoccupied houses and are ready to make life miserable for the first family which is so unfortunate as to move in.

Bedbugs hatch from eggs laid in places where the bugs find concealment, and the young are at first tiny pale insects not much larger than a pin head. These are quite active and crawl around seeking food, taking on a red color after their first meal of blood. When full grown they are reddish-brown, oval, and about ¼ inch long. They are sometimes found in poultry houses, where it is supposed that they feed upon the poultry at night.

Control Methods.—The best way to eradicate bedbugs is to fire the heating plant and maintain a temperature of about 130 degrees F. for a few hours, or fumigate the house with hydrocyanic acid gas (see page 37) or sulfur fumes (see page 39).

The use of old fashioned household remedies are effective though at a considerable cost of time and effort. They are recommended in case of light or recent infestations, or where the bugs are concentrated in a few places. Perhaps the most efficient of these is the spraying of gasoline or kerosene into all cracks and crevices where the bugs may hide. Liberal use of hot water is recommended unless it will damage furniture or finishing. All of these remedies destroy eggs as well as active bugs.

For these temporary remedies to be effective, the housewife must make frequent inspections of likely places, such as the seams and tufts of mattresses and places in the room where the insect may find concealment. A vigorous campaign against the bugs, persisted in for a period of ten days or two weeks, should result in relief unless the insects are too numerous to be reached through home remedies. *Necessary precaution must be used to guard against fire when using gasoline to kill bedbugs.*

FLEAS *(Ctenocephalus felis* and *C. canis)*

Fleas in the home are associated with pet animals. The cat and dog fleas are the ones found infesting houses. The adults feed on the blood of these animals where they cling tightly to the skin at the base of the hair. They deposit eggs in the fur or hair of the animals, and the larvae which hatch from these live in dust and lint on the floor, in cracks, under carpets, under porches where dogs sleep, and any place that offers food where they are not disturbed. They feed upon bits of hair shed by the animals, dried flakes of skin, dried blood, etc. When mature, the larva constructs a silken cocoon and transforms into a pupa. The adult flea emerges from the cocoon. During the summer a complete generation is passed in from 17 to 35 days.

While fleas are found breeding in sleeping places of cats and dogs, they also infest lawns at times, and have been found to breed in protected places under shrubbery or in the shade of buildings in dry places which contain animal matter. Persons who acquire fleas by walking through lawns evidently encounter adults which have dropped from the bodies of animals or have spread from nearby sleeping places of animals. The abundance of fleas seems to be largely determined by the weather conditions, presence of the host animals, and undisturbed larval feeding places.

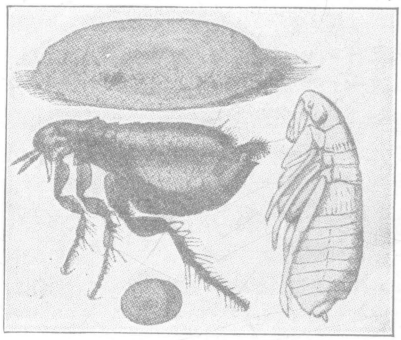

Fig. 26.—The Cat and Dog Flea.—Egg, larva in cocoon, pupa and adult flea (after Howard).

Hords of fleas may infest houses where the pet animals or hogs are allowed to lie beneath the house or any part of it. Likewise they may overrun houses which harbored dogs or cats and which have been vacated for a few weeks or months. Frequent complaints come from people who have returned from vacation during the summer and reoccupy their homes where pets had been kept before vacation began.

How to Rid a House of Fleas.—To exterminate fleas, first bathe the infested dogs and cats with a 3 per cent creolin solution or similar preparation, which kills the fleas; then keep the dogs and cats out of the house until it is free of fleas. If the entire house is infested with fleas, the best procedure is to fumigate with hydrocyanic acid gas (see page 37) or powdered sulfur (see page 39).

If fumigation of rooms or heating is not undertaken, remove the floor coverings and clean and air them. Sweep up all lint and dust and burn same. Scrub the floors with strong soapsuds or spray with gasoline, being careful to avoid fire. After sprinkling pyrethrum powder over the floor, return the floor coverings. Burn the dust collected by vacuum cleaners promptly after each sweeping.

If outside sleeping places have been used by the pet animals, treat these with boiling water or clean them out thoroughly; if the latter is done, either burn the dry animal and vegetable matter thus collected or scatter the dirt thinly over exposed soil. Prepare a clean place for sleeping quarters of pet animals and spray their bedding thoroughly twice each week with kerosene, gasoline, or one of the proprietary mixtures.

To prevent reinfestation of the house, keep dogs or cats out

of the home. If this is not desirable, either bathe them frequently with soap and water, working the soap into the hair, or dust their hair regularly with insect powder. Either method will cause the fleas to come out where they can be destroyed.

MOSQUITOES *(Culex pipiens* et al*)*

There are many different kinds of mosquitoes that attack man, but the species that commonly enters houses and is a pest in Ohio is known as the "house mosquito." The adults are abroad at night and the females pierce the skin and suck blood. Their record of being a pest of much annoyance is only too well known to everyone.

The house mosquito lays her eggs in a mass on the surface of standing water, in fresh water pools such as in ditches, swamps, watering troughs, rain barrels, or even in tin cans which have collected rain water and hold it. The eggs hatch in about 24 hours into small "wrigglers" which feed upon the animal life in the water. They rest at the water surface to secure air unless disturbed. In about a week they transform into the pupa stage, during which they take no food. In another two or three days the adult mosquito crawls out.

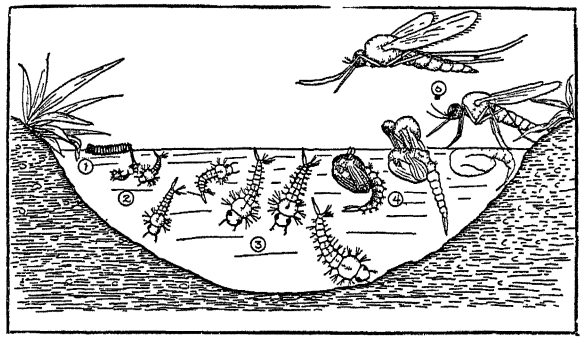

Fig. 27.—The history of the house mosquito: (1) eggs; (2 and 3) larvae; (4) pupa, (5 and 6) adults. (adapted from Headlee).

Rainy weather, which keeps water holding places well supplied but will not cause the water to flow, is the weather that is favorable for breeding mosquitoes. The adult is not thought to fly far from its breeding places, and infestations around homes may be due to pools or receptacles holding water in close proximity to the house. There is evidence that when mosquitoes become a scourge in a community they may travel as much as two miles from their breeding places.

Some species of mosquitoes transmit yellow fever in countries where this disease is present. One species transmits and is a necessary host of malarial fever, so prevalent in some of our southern states. In Ohio, cases of malaria are usually traceable to the patient having lived in the south and mosquitoes in our state are probably not to be considered as disease carriers.

Control Methods.—The most complete and permanent control of mosquitoes is the elimination of their breeding places. These can usually be found after a little inspection of surroundings for standing water. The wrigglers are easily seen in the water. Proper drainage of pools or disposal of cans, pails, or other vessels which hold water should be undertaken. Rain barrels may be covered with a fine wire screen. If it is not possible to drain pools of standing water, a light application of crude oil or kerosene oil made every two weeks will prevent the larvae from breeding in the water.

Recently, it has been found that Paris green dusted lightly over the water surface will kill the larvae, as they consume the

Fig. 28.—An ideal breeding place for mosquitoes (after Osborn; photo by Evans).

solid particles on the surface. Stocking pools with fish will also remove the nuisance since fish feed upon these larvae.

Mosquitoes can go through common window screens, therefore, screens must be made of 14-mesh wire or finer to keep them out. There is nothing so satisfactory as the use of good window screens when it is impossible to remove the mosquito breeding places. There are several sprays now on the market that will kill mosquitoes when sprayed into a closet or basement where they collect and hibernate over winter. A good repellent to be applied to the face and hands of a person is very desirable at times. Probably the best repellent is either oil of citronella, used alone, or equal parts of spirits of camphor and cedar oil. An application of

such repellents usually insures protection for a time, but has to be renewed frequently.

CHIGGERS *(Leptus americanus)*

Chiggers are not true insects, but very small mites, scarcely visible to the naked eye. They do not enter homes, except upon the bodies of persons, and there they are present by accident rather than choice. The complete life history of the man-infesting chigger is not known, but they have been found attached to the bodies of some snakes, and in Japan, on the bodies of ground mice. They are found on the soil and low growing vegetation and are liable to crawl upon people who stand or lie in reclining positions in infested places. They pierce the skin and are said to attempt to burrow into the skin at the hair follicles, producing an irritation at the point of attack.

The best remedy for chiggers is prevention. This consists of preparing the body for exposure to chigger habitat. This may be done by wearing boots or high top shoes, or by thoroughly dusting the underclothing and socks with powdered sulfur before going into chigger infested places. One should also avoid sitting or lying on lawns known to be infested.

The irritation caused by chiggers may be alleviated somewhat by application to the affected parts of weak ammonia or a soda solution.

Pests that are Accidental and Annoying

CLUSTER FLY *(Pollenia rudis)*

In a discussion of household insects some mention should be made of these flies, which make their way into dwellings. The cluster flies are a trifle larger than the common house fly, and the manner in which they fold their wings make them appear longer and narrower than ordinary flies. In autumn they enter the dwellings and collect on the window curtains, in the corners of the rooms, or in the closets. In early spring they collect on the inside of windows trying to get out.

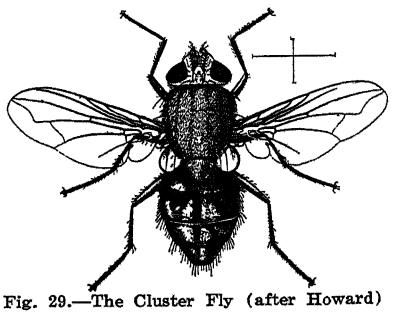

Fig. 29.—The Cluster Fly (after Howard)

Such places as attics, closets, unused rooms, or vacant houses

are most commonly frequented by these insects. Occasionally they are quite annoying in both fall and spring. Screens that are ordinarily effective against the common house fly do not prevent the entrance of these pests.

The flies overwinter in buildings or other protected places and emerge in April to lay eggs. The eggs are laid in cracks of the soil. In about three days they hatch into very active maggots, some of which are known to enter the bodies of earthworms, where they feed and complete their growth. There may be other unknown hosts of the larvae.

There are possibly four generations a year; the last brood of adults emerges in late September and October. At the approach of winter, they migrate to protected places, such as under the siding and sheathing of houses.

Control Methods.—Cluster flies seldom become abundant enough to warrant control measures. However, in case they do, spraying with some of the proprietary fly sprays would kill them. Because of the sluggish nature of these flies, they can be collected and destroyed very easily. If they cluster to the windows in the spring, lower the windows slightly from the top and they will willingly depart.

Book Lice *(Atropos sp.)*

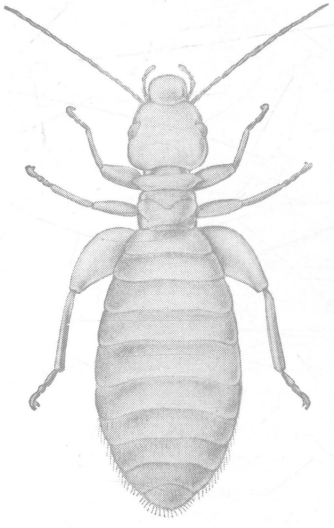

Fig. 30.—Book-louse or psocid, greatly enlarged. (U. S. Dept. of Agriculture.)

Book lice are very small insects scarcely 1/20 inch long, wingless and pale straw colored. They are scarcely large enough to be seen by the naked eye as they travel across a paper or the surface of furniture. They are often found associated with books, from which they get their name, but at times they are found in large numbers in upholstered furniture and mattresses, and crawling over the walls and floors of houses.

When a house has been closed up for the summer and the rooms have been darkened for some time, these insects are likely to make their appearance.

Book lice do no serious damage, but feed on starchy materials such as paste from wallpaper and book bindings, and

glue. They are fond of congregating in the packing of overstuffed furniture, whether it contains straw, moss, animal hair, or cotton, and they are a pest merely because of their presence there. The eggs are laid throughout the material frequented by the lice and hatch in the spring. These insects are so small that a few of them are unnoticed, but when numerous, call for control measures.

Control Methods.—Where mattresses are known to be infested they should be burned. The insects can be exterminated in valuable furniture by the use of heat (see page 40) or fumigating with hydrocyanic acid gas (see page 37).

Where rooms are regularly cleaned and aired these insects are rarely troublesome. They thrive best in rooms which have been unused and closed to air and sunlight.

SILVER FISH *(Lepisma saccharina)*

In moving old books from shelves, or in moving a rug from the floor of a room which has not been used for some time, a small, pearl gray insect may be seen scurrying away to get under cover. This insect has several common names, such as fish moth, silver witch, sugar louse, slicker, sugar fish, and bristle tail. The name "moth" is a misnomer, because it is not closely related to the true clothes moth nor are its food and habits the same.

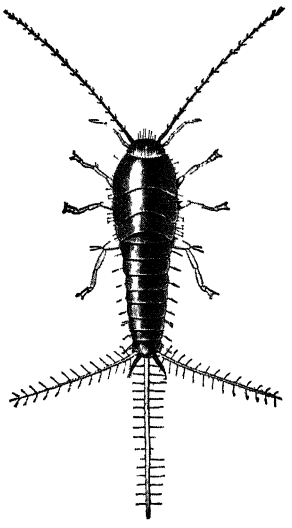

Fig. 31.—The Silverfish. Adult—enlarged (after Marlatt).

The silver fish has no wings, but it has six rather long legs, which enable it to run rapidly. On the posterior end of the body are three long thread-like projections. The body is covered with minute pearl gray scales which make the body slippery, and it is about impossible to pick up the insect without crushing or mangling it. It shuns light and darts swiftly into places of concealment.

The silver fish feeds on starchy materials, such as book bindings, paste in wall paper and on glue. It also feeds on stored starched clothing. It is seldom that the silver fish causes damage, except where its food has been left undisturbed for long periods packed away in drawers, closets, bookcases, or other such places. In the average home it is an annoyance, because of its presence rather than from any damage it does.

Because this insect shows a preference for dark, damp places, books and valuable paper should be stored in the light and in a dry room. White arsenic mixed with a sweetened paste has been used effectively as a poisoned bait when smeared on bits of cardboard and placed where the insects frequent.

Caution

Poison baits for insects should be kept out of reach of small children.

HOUSE CENTIPEDE *(Scutigera forceps)*

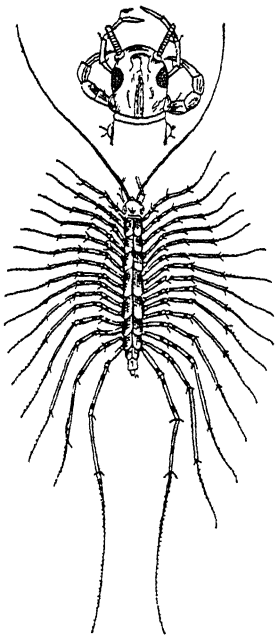

Fig. 32 — House Centipede about natural size Above, head of same greatly enlarged (After H. C Wood)

Almost everyone has at some time or other seen this long-legged creature darting across the floor or wall. It may run for a short distance, remain motionless for a few seconds, then after a short pause it may start running quite rapidly to get under cover.

The house centipede is not an insect, but belongs to the Myriopoda commonly called "thousand-legged worms." It is a lover of dampness and frequently is present in cellars, bathrooms, and kitchens.

These insects may become abundant enough to annoy the inhabitants of the infested house. However, they must be considered a friend, because they prey upon the eggs and young of household insects, which are pests.

If they become too abundant for comfort, they may be killed by crushing or by spraying them in their favorite haunts (such as around drain pipes and other damp places) with kerosene or a pyrethrum spray. It is necessary to strike the centipedes with such sprays.

CLOVER MITE *(Bryobia praetiosa)*

This is not frequently a house pest, but occasionally it migrates into dwellings, where its presence is annoying. This mite is so small

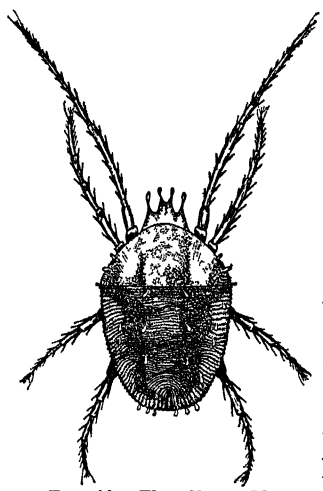

Fig 33.—The Clover Mite, adult, enlarged (after Marlatt).

it can scarcely be seen with the naked eye. It is somewhat oval in shape and reddish-brown in color. It is primarily a pest of clover, but almost every spring the little creature is reported as infesting dwellings.

The red eggs may be found during the winter in masses in the crotches of small limbs of the apple and other trees. The mites do no great harm in the house, but when occurring in great numbers their presence is quite disagreeable. Spraying with benzine and gasoline will kill all that are reached by the spray. A coal tar barrier near the foundation wall just outside the house will prevent the mass gaining access, if their presence is detected before many have entered the home.

House Fumigation

Houses may be fumigated to kill insects with (a) hydrocyanic acid gas, (b) fumes of sulfur, or (c) by heating the air in the room to a high enough temperature. Fumigating with formaldehyde fumes or solution is useless to kill insects.

Hydrocyanic Acid Gas

Hydrocyanic acid gas is one of the most poisonous gases known and is the most satisfactory one to use where gas fumigation is undertaken. Until recently the standard method used was to unite sodium or potassium cyanide with sulfuric acid and water. This results in the giving off immediately of a heavy concentration of this gas. This is still the method preferred under some conditions, but the sudden liberation of large amounts of this deadly gas is so dangerous to human life that we do not care to recommend it as a method for the general public to use.

Within recent years hydrocyanic acid gas fumigation with calcium cyanide has come into use. This method results in the liberation of the gas slowly, which makes it safer for the average person to use.

CAUTION

Hydrocyanic acid gas is dangerous. Do not enter a room being fumigated until it has previously been aired

The following directions pertain to the use of calcium cyanide fumigation:

First seal the cracks and crevices around windows in order to make the room or house as nearly airtight as possible. It will be impossible to get a sufficient concentration of gas if openings allow interchange of air with the outside. Next, place newspapers or building paper over the rugs or floor coverings, so that a considerable portion of the floor surface is covered. Weigh out for each room sufficient calcium cyanide dust, figuring the amount needed

Fig. 34.—Distributing calcium cyanide in preparation for hydrocyanic acid gas fumigation (Original).

at the rate of 1 pound for each 1000 cubic feet of space in the room; use a separate container for the amount needed in each room, where it should be deposited in preparation for the fumigation. Weighing should be done out-of-doors to prevent unnecessary breathing of the gas. Then see that one or more windows in each room can be raised from the outside, so that the operator can open the house without entering it after fumigation.

Begin applying the chemical in the upstairs room which is farthest from the exit. Proceed by spreading the chemical thinly over the papers so that air can quickly reach a large surface of

the cyanide. Continue as above, passing from room to room, and finish in the room nearest the exit. Close the door and place a warning sign on the outside to prevent anyone from entering.

If a basement is to be treated and has an outside entrance, treat it last. If it has an inside entrance, have a second person apply the chemical there while it is being applied on the ground floor. Be sure that all helpers leave the building promptly at the conclusion of the fumigation, and do not reenter until fumigation is completed.

As the moisture in the air reaches the chemical, the poisoned gas is generated rather constantly for two or three hours. If the house is well sealed, a high gas concentration will remain for some time and penetrate all parts of the rooms. Fumigation should continue preferably for 24 hours, although, if it is impossible to vacate the house, the charge may be set early in the morning and the house aired out late in the afternoon. Fumigate only when the temperature is above 70 degrees F. If unholstered furniture is to be fumigated, loosen the covering on this at a few places.

At the conclusion of fumigation, open the windows and doors from the outside and allow the room or rooms to air for one hour before entering. It is then safe to enter and remove the paper with the cyanide residue, destroying the same immediately. The odor of the cyanide will remain for a while, but in time it will disappear.

Hydrocyanic acid gas is not explosive when mixed with air, hence this method has no fire hazard. The gas is slightly lighter than air and for this reason it is an advantage to have air currents circulating within the room by the use of a small electric fan. The gas will not bleach fabrics or tarnish metals as is the case with sulfur fumes.

Hydrocyanic acid gas kills all insects in the active stage and even penetrates to the interior of mattresses. It may not kill all eggs hidden away in crevices; if reinfestation occurs another fumigation should be made after the eggs have hatched.

Calcium cyanide can be secured from dealers in greenhouse supplies or from leading seed stores. It costs 50 to 75 cents a pound, depending upon the amount purchased.

Fumigating with Sulfur

Fumigation with sulfur is already known to the public. It consists of burning powdered sulfur and allowing the fumes to disseminate through the rooms. It can be purchased in the form of candles ready to be used.

Sulfur fumigation is effective for most insects, but sulfur fumes are known to have a bleaching effect upon certain colors in wall paper and fabrics, and they tarnish metals. Strings of pianos are likely to rust after sulfur fumigation. For these reasons the hydrocyanic acid gas or heat methods are preferred in furnished homes.

Prepare the rooms for fumigation as with calcium cyanide, then weigh out the amount of sulfur required for each room, using 4 pounds of sulfur for each 1000 cubic feet of room space. Provide a metal tub or bucket, the bottom of which should be covered with 2 or 3 inches of ashes. Place in this an iron vessel containing the mound of sulfur with a small depression made in the top of the sulfur into which wood alcohol can be poured for igniting the sulfur. Ignite the alcohol as you pass from room to room in the manner described for liberating hydrocyanic acid gas. Allow fumigation to continue for 18 or 24 hours. Watch the behavior of the burning sulfur through a window and have fire extinguishers close at hand to take care of any emergency.

Directions for the use of burning sulfur candles usually are supplied by the dealer.

At the end of fumigation, air out as given for hydrocyanic acid gas and repeat if necessary in case a new infestation occurs from eggs not killed by previous fumigation.

Fumigation with either sulfur or hydrocyanic acid gas is injurious to potted plants. They should be previously removed.

House Superheating

Most insects are unable to long survive a temperature between 125 and 135 degrees F. This fact is utilized in mill fumigation and in sterilizing breakfast foods and package cereals. Insects can be killed in the home if the temperature is maintained at this point for three or four hours. It is possible to do this during midsummer by firing the heating plant and concentrating the heat in one or two rooms at a time. Houses can be effectively and cheaply freed from bedbugs, fleas, clothes moths, or other insects by this method. The heat kills all stages of the insects, including the eggs.

The work should be undertaken only on a hot, still day and only during the summer months. Furnishings and floor coverings should not be removed from the room. A good thermometer should be used to insure that the necessary degree of heat is maintained.